

MARINE SINGLE SIDEBAND

Model 922 SSB RADIO TELEPHONE

INSTRUCTION MANUAL

- INSTALLATION
- OPERATION
- MAINTENANCE

Reprint of Section III only
INSTALLATION
SUGGESTED ANTENNA SYSTEMS



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SECTION III

INSTALLATION

GENERAL

Installation of the Model 922 consists of locating and mounting the radio-telephone, installing cables to the power source and erecting a suitable antenna/ground system.

RADIOTELEPHONE

Select a convenient operating location for the radiotelephone. The mounting cradle is reversible so that the set may be mounted on an existing shelf, to a bulkhead or to an overhead surface. A small bracket at the rear of the mounting cradle is intended to engage a slot on the large heatsink at the rear of the radio-telephone. The bracket is supplied for shelf mounting; it is necessary to reverse the bracket when the set is bulkhead or overhead mounted.

POWER CABLES

Peak current consumed by the Model 922 may be as high as 18 amps. Power cables should be at least 10 gauge wire for cable runs up to 12 feet; for longer runs use at least No. 8 gauge wire. When connecting to the set, proper polarity must be observed. A protective diode in the set will blow the rear-panel circuit breaker if the power cables are improperly connected.

ANTENNA/GROUND SYSTEM

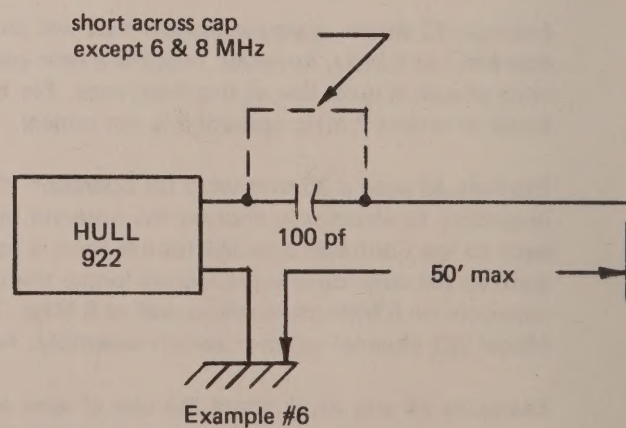
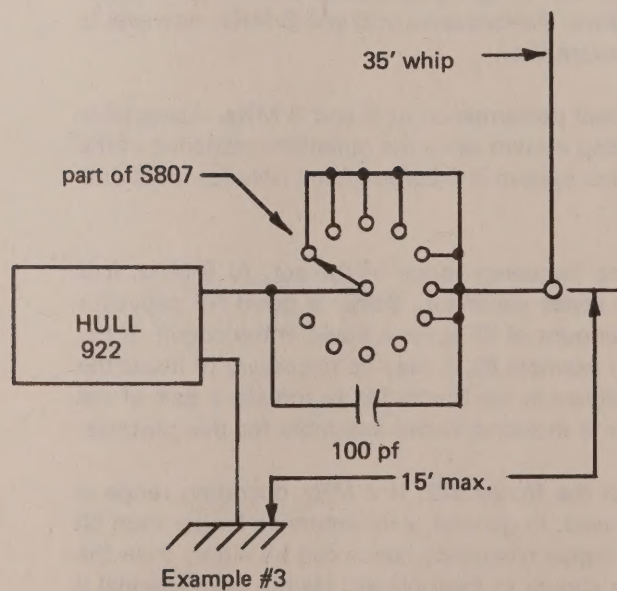
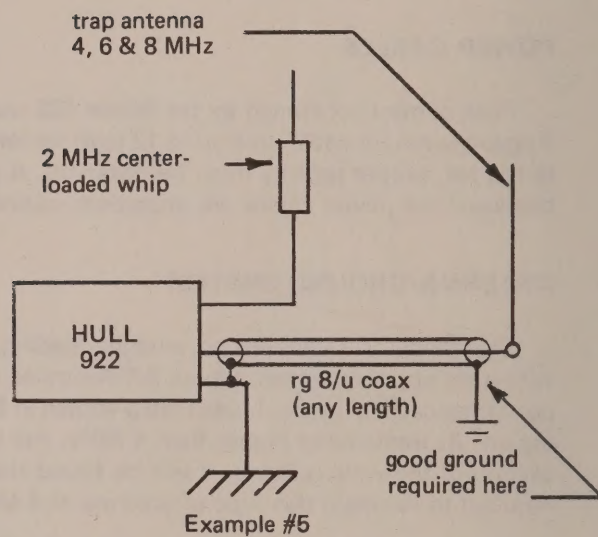
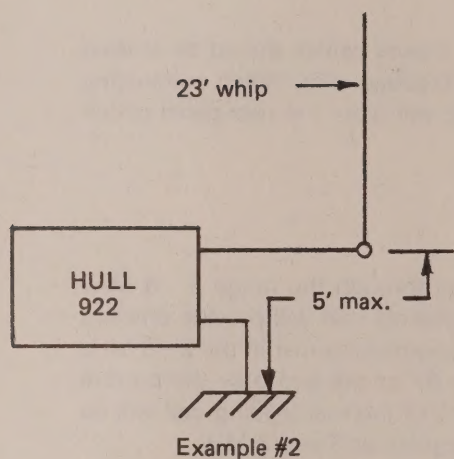
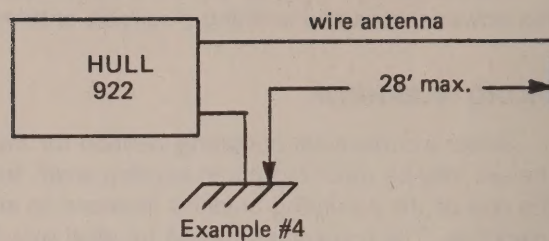
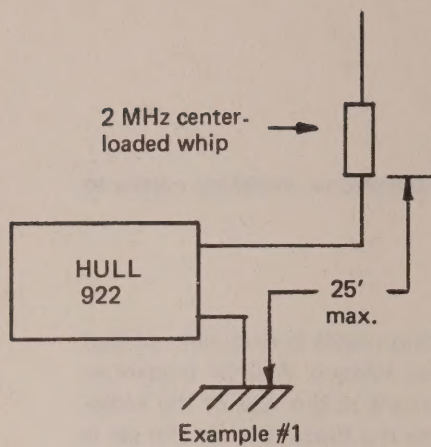
The Model 922 contains an antenna loading coil that permits operation through the range 2 - 8 MHz with a variety of antennas. Figure 3-1 illustrates six examples of antenna systems that will provide efficient performance. The center-loaded whip shown in Example #1 operates in the normal manner in the 2 - 3 MHz region. At frequencies higher than 4 MHz, the loading coil appears as an RF choke and only the bottom section of the whip radiates. It will be found that a relatively large amount of internal loading coil will be required to resonate this type of antenna at 4 MHz. Less loading coil is required at 6 and 8 MHz.

An advantage of the system shown in Example #1 is that the center-loaded whip is capable of better performance at 2 MHz when the ground system is less than ideal. Performance at 6 and 8 MHz, however is not as efficient as the systems shown in some of the other examples.

Example #2 shows a simple system that will provide near ideal performance at 6 and 8 MHz. Acceptable operation at 2 MHz, however, requires a near-perfect grounding system since the radiation resistance of the whip shown is quite low at this frequency. For this reason, the system is recommended only for metal-hull boats or where 2 MHz operation is not critical.

Example #3 uses a 35-foot whip for operation throughout the frequency range of the set. At 8 MHz, it is necessary to electrically shorten the antenna by inserting a series capacitor. Select a good RF capacitor such as the Centralab type 850 for use here; a considerable amount of RF current flows in the circuit. If the leads to the antenna and ground are longer than as shown in example #3, it may be necessary to insert the capacitor on 6 MHz channels as well as 8 MHz. The switch shown in the illustration is actually a part of the Model 922 channel-selector switch assembly. A blank wafer is included in the assembly for this purpose.

Examples #4 and #6 illustrate the use of wire antennas with the Model 922. If 2 MHz operating range is important, the longer wire shown in Example #6 should be used. In general, wire antennas longer than 50 feet should be avoided since their radiation resistance at the higher frequency bands can be higher than the set is capable of matching into. The use of two antennas is shown in Example #5. Here a conventional 2 MHz center-loaded whip is used for 2 - 3 MHz channels and a coaxial-fed "trap" antenna operates on the HF channels. The trap antenna requires a good ground at the point where the coaxial cable and antenna base are joined.



SUGGESTED ANTENNA SYSTEMS
fig. 3-1

GROUND SYSTEMS

The Model 922 requires an adequate grounding system for good performance. On wood vessels, a copper ground plate of at least 30 square feet should be attached to the outside of the hull. Studs must be brazed to each end of the plate to serve as connections to the radiotelephone. Make all connections as short as possible and with flat copper strap two or more inches wide.

If a long ground lead is necessary, two or more separate runs of flat copper strap should be used to each stud. The ground system may be improved by bonding all metal objects in the vicinity of the installation to the ground strap. Bonding connections should be soldered if possible.

At 2 MHz, the surface of the sea is the effective ground. However, at the higher frequencies, in most cases the antenna is located an appreciable fraction of a wavelength above the sea and a new ground plane closer to the antenna must be established. If a sufficient quantity of metal exists near the level of the antenna base, it can be bonded together to form a ground plane. Such objects as life-lines, hydraulic steering lines, etc. can be used for this purpose. If this proves to be inadequate, it may be necessary to cover the cabin ceiling with copper screen to form the ground plans. The screen should be painted over for protection from the weather. Sometimes a series of wire radials may be used in place of the screen to achieve the same purpose.

TUNE-UP PROCEDURE

NOTE: The following Tune-up procedure assumes that the Model 922 has been bench programmed for operation on the desired frequencies and modes of transmission. If the set has not been programmed, see section V of this manual.

Loading to Short Whip Antennas:

A tapped matching transformer is provided within the set for matching the 50 ohm transmitter output to the equivalent resistance of the antenna system. Depending on the length of antenna, length of ground lead, operating frequency and the efficiency of the ground, the resistance factor of the antenna system will vary from 3 ohms or less to 50 ohms or more. As a guide to selecting the proper tap on the matching transformer, refer to the chart below:

<u>Antenna Type</u>	<u>2.0 MHz</u>	<u>2.7 MHz</u>	<u>4 MHz</u>	<u>6 MHz</u>	<u>8 MHz</u>
35' Unloaded whip	4	6	12	50	73*
23' Unloaded whip	4	6	9	25	36
2800 Loaded marine whip	12	16	12	16	25

*May require 100 pf series capacitor. See Programming Procedure.

NOTE 1: The above figures assume a short antenna lead-in, a short ground lead and an excellent ground such as provided by a metal hull vessel. If the ground is less than excellent, add a factor of 5 to the above figures and choose the nearest tap.

NOTE 2: All tuning of the set must be done with the bottom cover and the front section of the top cover in place and screwed tight. The rear section of the top cover is fiberglass; the tuning will not change when this piece is installed.

After the starting transformer tap is connected (use the RMA color code wire leading up from the Channel switch wafer) a starting tap on the antenna loading coil should be made. Quite often this can be found by selecting the tap that produces maximum atmospheric noise in the receiver. Switch the meter switch to AMPS position and push the TEST button on the front panel. (This keys the transmitter on and applies a two-tone test signal into the audio input). If the meter reads some low value, try other taps on the antenna load coil. This can be done with the TEST button pressed since the transmitter is fully protected from mis-match conditions. A coil tap position should be found which causes the meter reading to rise to 12 or more. If not, try another tap on the matching transformer.

When a tap on the loading coil and a tap on the matching transformer have been found that causes a high AMP meter reading, switch the meter switch to SWR position. Press the TEST button and note the meter reading. A reading of 5 or less indicates an excellent match and optimum power into the antenna. If the reading is higher than 5, a combination of taps can probably be found that will provide a lower reading. The transmitter is tuned for optimum performance when the AMPS meter reading is 15 and the SWR reading is 5 or less.

Loading to 50 ohm Trap Antennas:

Coax-fed antennas must be connected to the set via the coax fitting on the rear panel. Make certain that the unit has been programmed for the correct antenna type on each given channel prior to installation.

Connect the correct RMA color-coded wire to the 50 ohm tap on the matching transformer. Press the TEST button and note the SWR reading on the meter. A reading of 5 or less indicates a good match. A higher reading indicates the presence of standing waves on the antenna transmission line. Try both the 36 and 73 taps on the matching transformer; quite often one of these taps will prove a better match to the transformer. If neither tap will provide a SWR reading of 5 or less, the grounding to the base of the antenna should be improved to reduce the standing waves on the line.

NOISE SUPPRESSION

The Model 922 incorporates a highly sensitive receiver that responds to interfering electrical noise. Optimum performance can be obtained only if the electrical system on the vessel is treated for suppression of noise. The techniques to be used are identical to those used for any marine installation and include bypassing and filtering the alternators and installing radio suppressors or shielding the ignition wiring.

After the installation has been noise suppressed as much as possible, the set should be operated with all electrical equipment running. Listen for signs of blocking in both the SSB and AM receiving modes. Should blocking exist, it is necessary to reduce the RF gain of the receiver. The control for RF gain is located inside the set to the left of the speaker. Turn the control counter-clockwise until the blocking condition is cured.